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Trust and Economic Growth: A Robustness Analysis

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Abstract

Economists increasingly pay attention to social capital as an important determinant of macroeconomic growth performance. At the same time, there is discussion regarding the robustness of the results of empirical growth studies. In a seminal paper, Knack and Keefer (1997) assess the effect of trust on growth. This paper analyses the robustness of their results along several dimensions, acknowledging the complexity of the robustness concept. Our findings show that the robustness of the relationship between trust and growth in terms of both the size and the significance of the estimated effect, is highly dependent on the set of conditioning variables. An answer to the question whether there is an economic payoff of trust – and if so, how large this payoff actually is – is therefore difficult to provide on the basis of cross sectional empirical growth studies.

JEL-code: C12, Z13

Keywords: Robustness, Trust, Economic Growth

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1. Introduction

Economists increasingly pay attention to social capital as an important determinant of macroeconomic performance. The revival in interest for social capital has been triggered by intuitively appealing studies of Putnam et al. (1993) and Fukuyama (1995). Putnam's 1993 *Making Democracy Work* has raised the interest of economists in more culturally based factors that influence economic growth. Also Fukuyama's study on *Trust* has contributed to the increased attention for the relevance of social capital in economics. According to Fukuyama (1995), societies endowed with generalised trust enjoy a form of social capital, that complementary to traditional factor endowments such as labour and capital, contributes to their success in modern economic competition. Fukuyama argues that non-family or generalised trust is of importance for successful performance in advanced economies. Although the way economists use a traditionally sociological concept like social capital can be criticised (Fine, 2001), it is probably one of the most successfully introduced 'new' concepts in economics in the last decade.

Two seminal empirical papers in the field of social capital are Knack and Keefer (1995, 1997). In their 1997 study they investigate by studying a cross section of market economies whether social capital has an economic payoff. For this purpose, they explore – amongst others – the relationship between interpersonal trust, norms of civic co-operation, and economic performance. In their empirical analysis, they primarily focus on the role of trust as they feel it is the most important indicator of social capital. Based on the World Values Survey that contains extensive survey data on respondents in a number of countries, they assess the level of trust in a society by using the question: "Generally speaking, would you say most people can be trusted, or that you cannot be too careful in dealing with people?". Trust is measured as the percentage of respondents in each country that replied "most people can be trusted". Data are a mix of 1981 and 1990 survey results. On the basis of their analysis for 29 countries, Knack and Keefer conclude that trust has a significant impact on aggregate economic activity. They state explicitly that ‘the coefficient for Trust [...] indicates that a ten percentage point rise in that variable is associated with an increase in growth of four-fifths of a percentage point’ (Knack and Keefer, 1997, p. 1260).

Their empirical analysis fits in the class of Barro regressions (after Barro, 1991). These regressions aim at finding the factors that can explain the variation in economic growth performance across large cross sections of countries. This type of analysis was severely criticised in an influential article by Levine and Renelt (1992) for its perceived lack of robustness. For some time, this analysis was considered as a ‘kiss of death’ for the empirical analysis of economic growth using Barro regressions. More recently, the robustness criterion adopted by Levine and Renelt was challenged by Sala-i-Martin (1997), who developed an alternative criterion to judge robustness. His approach results in a more ‘positive’ view on the possibilities to explain growth in a satisfactory and robust way. This discussion in the literature in a sense illustrates the lack of a generally accepted definition of robustness. Or alternatively, it illustrates that robustness is a multi-dimensional concept that cannot be analysed with one single indicator.

In this paper, we start from the latter notion regarding the concept of robustness. We analyse the robustness of the results obtained by Knack and Keefer along three dimensions of robustness. First we concentrate on the statistical significance of trust. We do not only apply the Extreme Bounds Analysis, but also consider the variations proposed by Sala-i-Martin. The second dimension along which we explore the robustness of Knack and Keefer’s results on trust is the influence of changing sets of conditioning variables on the estimated effect of trust. Finally, we analyse the sensitivity of the results for using different proxies for ‘basic’ variables like human capital and the rate of capital accumulation.

We show that Knack and Keefer's conclusion on trust is not as robust as it might appear. Both in terms of significance and size it is still not clear whether trust has an economic pay-off, and if so, how large it is. Most important is our finding that the significant and positive effect of trust on growth in Knack and Keefer's analysis is driven by a specific operationalisation of their independent variable that proxies the investment ratio**.**

We proceed with a general discussion on the concept of robustness in Section 2. In Section 3, we discuss the data and the methods to analyse robustness along three dimensions. The results of the different tests of robustness are discussed in Section 4. Section 5 concludes.

2. Robustness

The empirical literature that has aimed at finding the factors that can explain variation in economic growth has predominantly made use of simple linear cross-section regression equations. This literature has resulted in a plethora of statistically significant correlations between growth and explanatory variables such as investments, initial income, trade openness, degree of capitalism, etc. However, for almost all of these correlations, there are counterexamples indicating insignificant (or even opposite) correlations casting doubt on the robustness of the obtained results.

The issue of robustness was explicitly addressed in a seminal paper by Levine and Renelt (1992). Their analysis is based on the Extreme Bound Analysis as developed by Leamer (1985). The Extreme Bound Analysis (EBA) starts with the estimation of a series of regressions of the form

$$\gamma = F\alpha_j + \beta_{ij} x_i + C_j \gamma_j + \varepsilon_j, \forall i, j, \tag{1}$$

where γ is a vector of per capita GDP growth rates, F is a matrix of variables that are always included in the regressions (including a constant) with the associated parameter vector á$_j$, x_i

is the variable of interest with parameter â$_{ij}$, and C_j is a matrix of a subset of conditioning variables taken from the full set of potentially explanatory variables for economic growth, with ã$_j$ for the corresponding vector of parameter estimates. å$_j$ is a well-behaved vector of errors. The subscript i indexes the variable of interest and j the different combinations of conditioning variables. The matrix F contains variables that are typically included in almost any empirical analysis of economic growth. Among these variables are indicators for initial income to capture (conditional) convergence, and indicators for physical and human capital accumulation to capture the effects of (changing) capital stocks on growth. In the paper by Levine and Renelt, these variables are initial income, the investment rate, the secondary school enrolment rate and the rate of population growth. In his modification of the Levine and Renelt analysis, Sala-i-Martin (1997) uses initial income, life expectancy and the primary school enrolment rate as F-variables. The variable of interest can be any variable that the researcher thinks to be of vital importance in explaining variation in economic growth. In this paper, the main variable of interest is trust. Finally, the pool of additional explanatory variables consists of a wide range of indicators that in at least some studies have been identified as potentially relevant to explain variation in economic growth. For an overview of the wide range of variables that can sensibly belong to this pool, we refer to Durlauf and Quah (1999).

The basic idea of an EBA is to analyse the consequences of changing the set of conditioning variables C for the estimated effect of x_i on the rate of growth. For each estimated model j (where the model is characterised by its specific set of conditioning variables included in C), one obtains an estimate $\hat{\beta}_{ij}$ and a standard deviation $\hat{\sigma}_{ij}$. Leamer defines the upper and lower extreme bounds as, respectively, the maximum value of $\hat{\beta}_{ij}$ + $2\hat{\sigma}_{ij}$ and the minimum value of $\hat{\beta}_{ij} - 2\hat{\sigma}_{ij}$. A variable x is labelled as robust if the upper and lower extreme bound are both of the same sign. This condition boils down to *all* estimated coefficients being statistically significant at (approximately) 95% and of the same sign.

In a critique on the application of the EBA approach to assess the robustness of growth results, Sala-i-Martin (1997), proposed to relax the criterion imposed by Leamer. His basic argument is that the EBA-condition that a relationship should be significant as well as of the same sign in each and every regression equation is too strict. Instead, he proposes to consider the entire distribution of the estimated coefficients. His assessment of robustness is based on the fraction of the density function of the estimated coefficient that is lying to the right of zero. Provided that this fraction is sufficiently large (small) for a positive (negative) relationship, the relationship can be labelled robust. In his application, Sala-i-Martin uses a 'critical fraction' of 95%. Obviously, the number of robust relationships to be found by applying this less strict criterion increases.[2]

This discussion illustrates that there is no uniform definition for robustness. This is explicitly recognised in Florax et al. (2002), who consider a range of definitions of robustness. They analyse the sign, size, and significance of regression results. The analysis extends the work by Levine and Renelt and Sala-i-Martin by not only considering a wide range of robustness definitions but also, and more importantly, by explicitly analysing the robustness of the sizes of the estimated effects. The robustness criteria adopted by Levine and Renelt and Sala-i-Martin focus very heavily on statistical significance. Whether the estimated

[2] An alternative way to relax the criterion is to apply to so-called Reasonable Extreme Bounds test as proposed by Granger and Uhlig (1990). This test constructs the Extreme Bounds on the basis of a subset of estimated coefficients derived from regression equations with a relatively high goodness of fit measure. The logic for this test resides in the notion that regression equations with a low goodness of fit are less likely to be the correct ones. This can be seen as a justification for the exclusion of estimated coefficients derived from those equations. In our analysis, we also performed a Reasonable Extreme Bounds analysis as proposed by these authors. As the Reasonable Extreme Bounds analysis did not change our conclusions based on the strong Extreme Bounds Test as reported in Section 4, we decided not to show the results. Details are available from the authors. An alternative for this approach is the procedure of weighing regression results as proposed by Sala-i-Martin (1997).

effect sizes are robust to changes in the conditioning set of variables is hardly addressed. We refer here to McCloskey (1985), and McCloskey and Ziliak (1996), for a pervasive critique on this practice in economics. To assess robustness along this dimension, Florax et al. (2002) extend the definition of robustness by requiring that the average estimated effect sizes conditional upon the inclusion of a particular variable are within predetermined bounds from the overall average estimated effect size. On the basis of this analysis, they conclude that the range of robust variables is – in contrast to the positive conclusion by Sala-i-Martin – fairly limited.

In the remainder, we assess the robustness of the relationship between trust and growth as analysed by Knack and Keefer (1997), along three dimensions.[3] First, we concentrate on the statistical significance. Second, we explore the robustness of Knack and Keefer's results on trust in terms of effect sizes. And finally, we analyse the sensitivity of their results by allowing for different proxies for the set of fixed variables, i.e., initial income, human capital accumulation and average investment ratio.

3. Method and data

Our data-set is an extended version of the data-set constructed and used by Knack and Keefer. Its core consists of:[4]

(i) the dependent variable, being per capita GDP growth over the period 1980–1992;

(ii) the independent variables used by Knack and Keefer, being the initial level of GDP per capita in 1980, primary and secondary school enrolment rates in 1960, the price

[3] As Knack and Keefer explicitly state that they see trust as the most important indicator of social capital, we also concentrate on trust in our analysis. This implies that we focus on their analysis reported in Table 1 of their 1997 article.

[4] We refer to Appendix A for a detailed description of the variables and their sources. The entire data-set is available upon request from the authors.

level of investment in 1980 relative to the US, and the social capital variables trust and civic.

This data-set is further extended by a range of variables that have previously been identified as potentially relevant explanatory factors for economic growth.

Our analysis of the robustness of the results described by Knack and Keefer proceeds in two steps. First, we construct a data-base with the Barro regression equations that we use for our analysis. The regressions contained in this data-set are estimated with a varying set of conditioning variables as was done in the sensitivity analyses that we have discussed before. The variables that we take as fixed (the *F*-variables) in our analysis are a constant term, initial income, primary and secondary school enrolment and the price of investment goods relative to the USA. These are the four variables that are also included in all the regression equations estimated by Knack and Keefer (in their Table 1, p. 1261). Of all the remaining 27 variables we specifically analyse the robustness of trust. The subset of conditioning variables is taken from the full set of explanatory variables (except, of course, the fixed variables and the variable of interest under consideration). In each regression equation, we include three conditioning variables.[5]

To illustrate the size of the data-base that results from this analysis, let us take as an example the case in which trust is our variable of interest. From the pool of 27 conditioning variables, there remain 26 variables that can be added to the trust variable in groups of two to complete the three conditioning variables taken into account in every regression equation. This leaves us with 325 (=(27–1)!/(2!(27–3)!) regression equations to be estimated. If we want to analyse the robustness of one of the fixed variables, we have a pool of 27

[5] This number is admittedly arbitrary. We have experimented with including two or four conditioning variables, but this hardly changes the results. Details are available upon request.

conditioning variables to be combined in all possible combinations of groups of three leaving us with 2925 (=(27)!/(3!(27–3)!)) regression equations to be estimated.[6]

After the construction of the data-set, we assess the robustness of the relationship between trust and growth along the three dimensions mentioned earlier.

4. Robustness analysis

This section describes the results of our robustness analyses. The different subsections correspond with the three dimensions along which we explore the robustness of trust. In Section 4.1, we report on a series of robustness tests, ranging from the Extreme Bounds Test to a simple sign test. Section 4.2 analyses the robustness of the results in terms of estimated conditional effect sizes. Finally, in Section 4.3 we consider the sensitivity of the results for the choice of the set of fixed variables (the *F*-variables on human capital, initial income and the average investment ratio).

4.1 Dimension 1: Significance

Table 1 contains the outcome of the exploratory robustness analysis that we performed on the rate of economic growth. The table contains the mean of the estimated effect size, its standard deviation, a confidence interval, the fraction of positive effect sizes, the fraction of significantly positive and negative effect sizes and the outcomes of six robustness tests. The first and second test are the strong and weak sign test, respectively, indicating whether all or at least 95% of the effects are of equal sign. The third and fourth test are the strong and weak EBA test, indicating whether all or at least 95% of the estimated coefficients are significant and of the same sign. The fifth column reports the results of the weighted weak EBA test that

[6] The regression equations were estimated with a software package developed for robustness analysis, *MetaGrowth 1.0* (see Heijungs et al. 2001).

indicates whether the weak EBA test is passed. In this test, effect sizes are weighted with the log-likelihood. The sixth column reports the fraction of cumulative density function that is to the right of zero.[7] We label a variable robust if this fraction exceeds 95% or is less than 5%.

< Insert Table 1 around here >

The results reveal that none of the variables passes the strong EBA test. The only variable that passes all other tests is the number of years that an economy has been open. Of most interest for the present study are the results for trust. Trust is significant in 78.5% of the cases. Regarding trust, both the strong and weak sign test (T1 and T2) and the weighted extreme bounds test (T5) are passed. The strong and weak extreme bounds tests (T3 and T4) are not passed.

4.2 Dimension 2: Effect size

The second dimension of robustness focuses on the effect sizes of the estimated coefficients. The robustness tests so far have exclusively focused on the sign and significance of the estimated effect sizes. In the spirit of McCloskey (1985), we would like to emphasise the relevance of analysing robustness in terms of estimated effect sizes. For this aim, we perform a response surface analysis. This analysis focuses on the effects of changes in the conditioning set of variables on the estimated effect size. It can best be seen as the determination of *conditional* average effect sizes. In order to facilitate comparisons among different variables of interest, we relate the conditional means to their corresponding grand

[7] The last two tests were introduced and applied by Sala-i-Martin (1997).

mean (that is, the mean effect size independent of the conditioning variables that belong to the pool of conditioning variables). We refer to Florax et al. (2002) for technical details.

Figure 1 graphically illustrates the results of the response surface analysis for the mean effect sizes. For each variable of interest, the conditional means relative to the grand mean of that variable are depicted. If this ratio equals 1, the conditional mean is equal to the grand mean. If it is negative, the conditional mean is of different sign than the grand mean. The more it deviates from 1, the less robust the results are in terms of effect size. The figure clearly reveals the huge variation in the conditional average effect sizes. The average effect of most of the variables is – in other words – strongly dependent on the specific subset of conditioning variables included in the regression equation. For trust, the ratio ranges from 0.62 to 1.17. Despite this relatively wide range, trust is one of the most robust variables in terms of effect size. Whereas the former dimension of robustness showed that trust is significant in 78.5% of all possible regression specifications, this second dimension shows that the estimated effect of trust on growth is relatively stable compared to the other variables we used. Still, however, there is considerable variation in the (conditional) estimated effect size.

< Insert Figure 1 about here >

In order to illustrate the implications of this variation, we have determined what the minimum and maximum average estimated effect sizes imply in terms of the predicted growth differential between a hypothetical country that is characterized by a value of trust that exceeds the average for all countries with one standard deviation and a hypothetical country characterized by a value of trust that is one standard deviation less than the average for all countries in the sample. The trust variable in our data-base has a mean value of 35.8 and a standard deviation of 14.0. We thus calculate the predicted growth differential between a country with a score on trust equal to 49.8 (close to, for example, Canada) and a country with a score equal to 21.8 (close to, for example, Portugal). If we take the highest conditional average effect size, the predicted growth differential equals 2.22%, whereas if we take the lowest conditional average, it equals 1.18%. Knack and Keefer's statement that 'a ten percentage point rise in that variable [trust] is associated with an increase in growth of four-fifths of a percentage point' is in other words surrounded with a large band of uncertainty given the sensitivity of the estimated effect for the conditioning set of variables.[8]

4.3 Dimension 3: Sensitivity for fixed variables

So far, our robustness analysis has taken the fixed (*F*-) variables included in all the regression equations estimated by Knack and Keefer for granted. In this subsection, we analyse the sensitivity of their results for changing the set of fixed variables. First, instead of Barro-Wolf data on human capital, we used Barro-Lee data (further denoted BL) that are more recent than the Barro-Wolf data. Given that Knack and Keefer used the Barro-Wolf data referring to 1960, and estimated growth for the period 1980–1992, we choose to use the BL data not only for 1960, but also for 1980. The second change to the set of fixed variables is that we replaced initial income with the log of initial income, which is more common in empirical growth studies. Finally, we explored the possibility that results are driven by the investment variable that was chosen by Knack and Keefer. For this, we replaced the Price level of Investment (PI) with the average investment ratio over the period 1980–1992, taken from the Penn World Table. The latter one – despite its obvious endogeneity – is more frequently used

[8] The results for all other variables included in Table 1 are available upon request.

in growth regressions than the price of investment goods (see DeLong and Summers, 1991, and Easterly, 1993, for exceptions and discussion).

The results of replacing the fixed variables with these alternative measures for the robustness of the variables are presented as model I – VIII in Table 2. We have restricted attention to the key variable of interest, i.e. trust. In all cases, the relationship between growth and trust becomes less robust along all the indicators. Most striking is, however, the lack of significance of trust when the Price level of Investment (PI) is replaced by the investment ratio. As can be seen in model V, the fraction of significant results is 0.0% in that case.[9]

< Insert Table 2 around here >

Without going into detailed discussion of the results of the different model specifications, the overall conclusion seems justified that Knack and Keefer have estimated and presented results that tend to be relatively favourable to the effect of trust on growth. It is striking to see that inclusion of investment ratio instead of PI implies a relatively large reduction in effect size of the trust coefficient compared to the basic model (compare models I and V). In fact, trust is never significant in this regression specification. The tests show that trust only passes the weighted extreme bounds analysis, whereas if PI is included it passes the strong (T1) and weak (T2) sign test as well as the weighted extreme bounds test (T5) and the

[9] With respect to the discussion to include the price level of investments (PI), the average investment ratio (INV), or both, it is important to notice that in a later paper, Zak and Knack (2001) write in a footnote that 'trust was no longer significant in the growth regression when investment was included as a regressor', referring to the 1997 article of Knack and Keefer (Zak and Knack, 2001, footnote 17 on page 309). Though it is unclear whether they included INV in addition to PI or instead of PI, we have performed a robustness analysis for both specifications. Model V in table 2 shows the result on trust when INV is used instead of PI. In case INV is included as an additional regressor next to PI, trust is only significant in 37.2% of all possible regression specifications (not shown in table 2). The crucial question is whether from a theoretical point of view it is necessary to include both PI and Invest or if both are proxies for the investment ratio. It is clear that in both cases, the robustness of trust can be questioned (0.0% and 37.2% respectively).

weighted confidence interval approach (T6). If we estimate growth in the period 1980–1992 by changing the human capital data into Barro-Lee 1980 and using the investment ratio instead of PI, the trust coefficient yields a confidence interval between –0.002 and 0.011, implying that zero is within the confidence interval for the effect of trust on growth.

5. Conclusion

This paper has subjected the seminal analysis by Knack and Keefer on the economic payoff of social capital to a range of robustness tests. We concentrated on the supposed effect of trust on economic growth. The results reveal a rather limited robustness of the results presented by Knack and Keefer. The significance, sign and effect size of trust strongly depend on the conditioning set of variables taken into account in the regression analysis. The implications for predicted growth differentials were shown to be far-reaching. More specifically, we have shown that Knack and Keefer's statement on the effect of trust suggests a certainty that does not exist. According to our analysis, the effect of a 10% point increase in trust has an effect on growth ranging between 0.4% points and 0.8% points, depending on the set of conditioning variables. Moreover, we have shown that the inclusion of Price Level of Investment Goods is crucial for the significance of the relationship between trust and growth. Once we take another operationalisation of investments, trust is never significantly related to economic growth.

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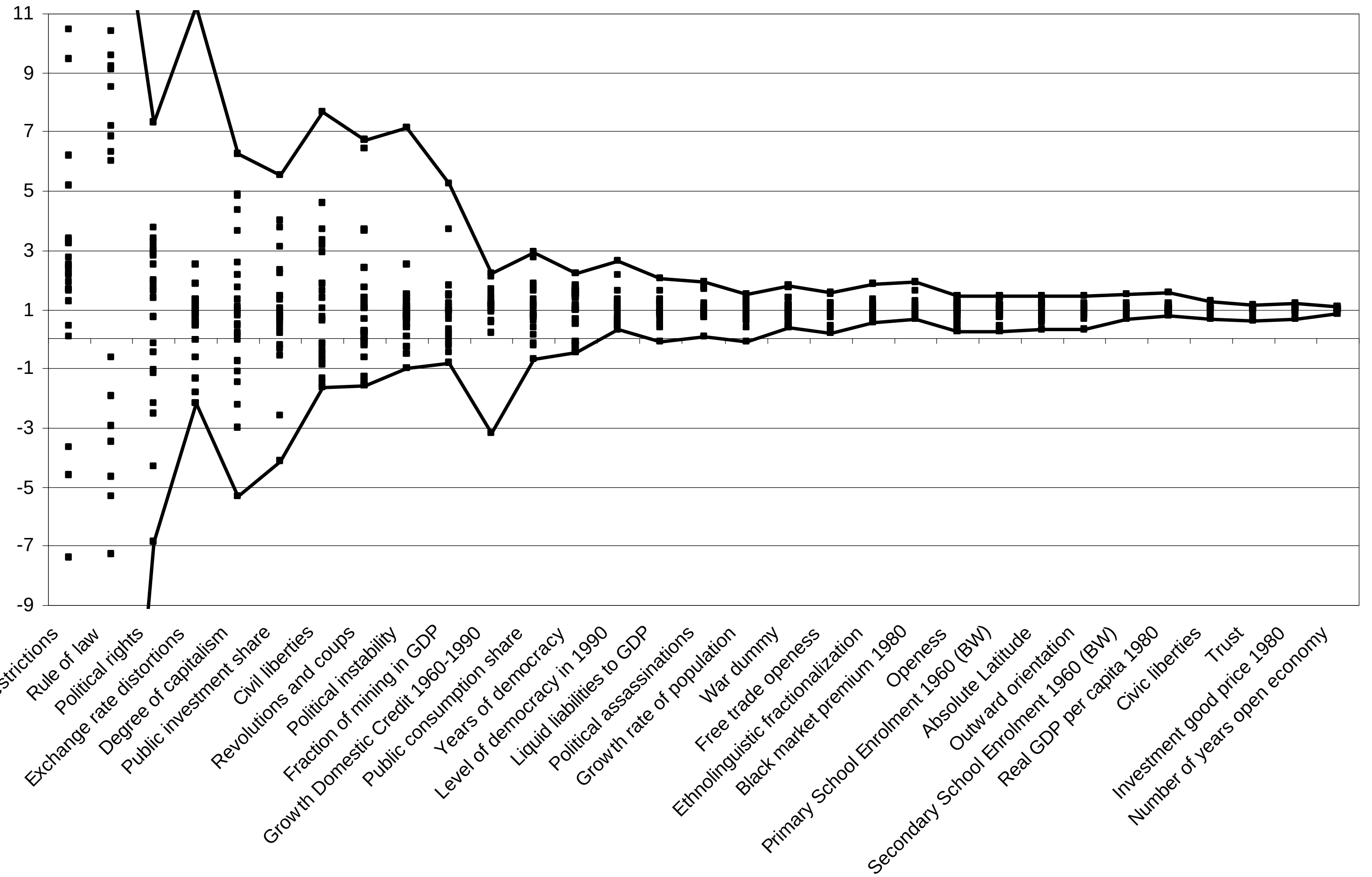
Figure 1. Conditional mean effect sizes relative to grand mean



Note: for reasons of scale, not all conditional means are depicted in the figures

Table 1: Main estimation and test results for growth regression

Name	Mean	St. dev.	Conf. Int left	Conf Int right	Positive	Sign +	Sign -	T1	T2	T3	T4	T5	T6
Primary School Enrolment 1960 (BW)	3.696	1.623	3.263	4.128	98.9%	42.1%	0.0%	-	+	-	-	+	0.968
Secondary School Enrolment 1960 (BW)	3.492	1.173	3.180	3.805	100.0%	22.0%	0.0%	+	+	-	-	+	0.952
Real GDP per capita 1980	-0.361	0.099	-0.387	-0.334	0.0%	0.0%	67.1%	+	+	-	-	+	0.010
Investment good price 1980	-3.012	0.782	-3.221	-2.804	0.3%	0.0%	77.9%	-	+	-	-	+	0.006
Number of years open economy	6.619	0.591	6.345	6.893	100.0%	99.4%	0.0%	+	+	-	+	+	1.000
Trust	0.068	0.013	0.062	0.074	100.0%	78.5%	0.0%	+	+	-	-	+	0.994
Civic liberties	0.257	0.064	0.227	0.287	100.0%	12.3%	0.0%	+	+	-	-	+	0.940
Absolute Latitude	0.045	0.019	0.036	0.054	97.5%	16.9%	0.0%	-	+	-	-	+	0.916
Outward orientation	0.736	0.220	0.634	0.838	100.0%	2.5%	0.0%	+	+	-	-	+	0.908
Openess	0.014	0.006	0.012	0.017	99.1%	6.5%	0.0%	-	+	-	-	+	0.901
Free trade openess	5.372	2.852	4.050	6.693	95.7%	14.2%	0.0%	-	+	-	-	+	0.892
Level of democracy in 1990	0.188	0.165	0.111	0.265	93.8%	8.9%	0.0%	-	-	-	-	+	0.789
Years of democracy	0.011	0.014	0.005	0.018	76.0%	0.0%	0.0%	-	-	-	-	+	0.691
Political instability	2.349	5.268	-0.092	4.790	74.5%	7.4%	0.0%	-	-	-	-	-	0.669
Exchange rate distortions	0.003	0.009	-0.002	0.007	68.3%	7.1%	0.0%	-	-	-	-	-	0.595
Revolutions and coups	0.475	1.615	-0.273	1.224	59.4%	1.5%	0.0%	-	-	-	-	-	0.570
Civil liberties	0.074	0.274	-0.053	0.201	57.5%	0.3%	0.0%	-	-	-	-	-	0.559
Public investment share	1.994	5.900	-0.739	4.728	65.8%	0.0%	0.0%	-	-	-	-	-	0.555
Tariff restrictions	1.415	20.572	-8.116	10.947	73.2%	0.0%	0.3%	-	-	-	-	-	0.544
Degree of capitalism	0.042	0.167	-0.035	0.120	61.8%	0.0%	0.0%	-	-	-	-	-	0.540
Rule of law	0.099	1.968	-0.812	1.011	55.1%	0.0%	1.2%	-	-	-	-	-	0.529
Political rights	-0.045	0.233	-0.153	0.063	37.5%	0.0%	0.0%	-	-	-	-	-	0.453
Public consumption share	-4.525	5.995	-7.302	-1.747	23.1%	0.0%	0.0%	-	-	-	-	-	0.393
Fraction of mining in GDP	-4.180	7.753	-7.773	-0.588	32.9%	0.0%	4.0%	-	-	-	-	-	0.338
Liquid liabilities to GDP	-1.110	0.747	-1.455	-0.764	6.8%	0.0%	0.0%	-	-	-	-	+	0.271
Growth Domestic Credit 1960-1990	-0.026	0.038	-0.043	-0.008	8.9%	0.9%	13.2%	-	-	-	-	+	0.170
Growth rate of population	-73.057	43.772	-93.338	-52.775	7.4%	0.0%	0.3%	-	-	-	-	+	0.146
Ethnolinguistic fractionalization	-1.424	0.687	-1.743	-1.106	0.6%	0.0%	9.8%	-	+	-	-	+	0.134
War dummy	-1.163	0.557	-1.421	-0.905	1.2%	0.0%	14.5%	-	+	-	-	+	0.090
Political assassinations	-155.256	95.717	-199.606	-110.906	3.1%	0.0%	49.8%	-	+	-	-	+	0.023
Black market premium 1980	-6.969	2.903	-8.315	-5.624	0.3%	0.0%	76.9%	-	+	-	-	+	0.005

The first 4 variables are fixed in all regressions. The results for these variables are based on 2925 regressions. The results for the other 27 variables are based on 325 regressions. The columns with the test results refer to: the strong and weak sign test (T1 and T2, respectively), the strong and weak extreme bounds test (T3 and T4), the weighted extreme bounds test (T5), and the weighted confidence interval test (T6); + indicates ‘pass’, and - indicates ‘fail’. The variables of interest are ordered according to a declining score on robustness test T6.

Table 2: Sensitivity for specification and choice of fixed variables

Model	Mean	Positive	Sign +	Sign -	T1	T2	T3	T4	T5	T6
I	0.068	100%	78.5%	0.0%	+	+	-	-	+	0.994
II	0.052	100%	36.6%	0.0%	+	+	-	-	+	0.964
III	0.047	99.1%	10.8%	0.0%	-	+	-	-	+	0.937
IV	0.055	99.7%	47.7%	0.0%	-	+	-	-	+	0.974
V	0.028	98.8%	0.0%	0.0%	-	+	-	-	+	0.825
VI	0.020	95.7%	0.3%	0.0%	-	+	-	-	+	0.779
VII	0.005	67.7%	0.0%	0.0%	-	-	-	-	-	0.568
VIII	0.016	0.3%	0.3%	0.0%	-	-	-	-	+	0.711

The different models correspond with different specifications of the fixed variables. The different tests T1-T6 correspond with those in Table 1. The results for trust and civic liberties are based on 325 regressions.

I: Basic model, see Table 1
II: Barro Lee 1960 instead of Barro Wolf 1960 for human capital
III: Barro Lee 1980 instead of Barro Wolf 1960 for human capital
IV: log (initial income) instead of initial income
V: Investment ratio instead of price of investment goods
VI: Investment ratio instead of price of investment goods and Barro Lee 1960 instead of Barro Wolf 1960 for human capital
VII: Investment ratio instead of price of investment goods and Barro Lee 1980 instead of Barro Wolf 1960 for human capital
VIII: Investment ratio instead of price of investment goods and log (initial income)

Appendix

This Appendix describes the variables that we have used in our analysis and their sources. The data-set is available upon request from the authors. All National Accounts Data were taken from the Penn World Table, Mark 5.6 (PWT56). The human capital data were taken from either Barro and Wolf (BW) or Barro and Lee (BL). The indicators for trust and civic cooperation were taken from Knack and Keefer (1997), who derived their data from the World Value Surveys (WVS). Indicators for democracy were taken from Inglehart (1997). All other control variables were taken from Sala-i-Martin (1997) (denoted by SiM below). We refer to his study for the precise sources of the readily available data that are commonly used in econometric growth studies.

Dependent variables:	
Growth of GDP per capita 1980–1992	PWT56
Average investment share 1980–1992	PWT56
Fixed variables:	
Primary School Enrolment 1960 (BW)	BW
Secondary School Enrolment 1960 (BW)	BW
Real GDP per capita 1980	PWT56
Investment good price 1980	PWT56
Primary School Enrolment 1960 (BL)	BL
Primary School Enrolment 1980 (BL)	BL
Secondary School Enrolment 1960 (BL)	BL
Secondary School Enrolment 1980 (BL)	BL
log(Real GDP per capita 1980)	PW56
Control variables and variables of interest:	
Trust	WVS
Civic liberties	WVS
Openess	SiM
Black market premium 1980	SiM
Growth Domestic Credit 1960-1990	SiM
Outward orientation	SiM
Free trade openess	SiM
Tariff restrictions	SiM
Growth rate of population	SiM
Number of years open economy	SiM
Public investment share	SiM
Public consumption share	SiM
Political assassinations	SiM
Revolutions and coups	SiM
Political instability	SiM
War dummy	SiM
Political rights	SiM
Civil liberties	SiM
Absolute Latitude	SiM
Rule of law	SiM
Exchange rate distortions	SiM
Liquid liabilities to GDP	SiM
Fraction of mining in GDP	SiM
Degree of capitalism	SiM
Years of democracy	Inglehart
Level of democracy in 1990	Inglehart
Ethnolinguistic fractionalization	SiM